

## **Stretch Reflex as a Simple Measure to Evaluate the Efficacy of Potential Flight Countermeasures Using the Bed Rest Environment**

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### **INTRODUCTION**

Spaceflight is acknowledged to have significant effects on the major postural muscles. However, it has been difficult to separate the effects of ascending somatosensory changes caused by the unloading of these muscles during flight from changes in sensorimotor function caused by a descending vestibulo-cerebellar response to microgravity. It is hypothesized that bed rest is an adequate model to investigate postural muscle unloading given that spaceflight and bed rest may produce similar results in both nerve axon and muscle tissue.

### **METHODS**

To investigate this hypothesis, stretch reflexes were measured on 18 subjects who spent 60 to 90 days in continuous 6° head-down bed rest. Using a motorized system capable of rotating the foot around the ankle joint (dorsiflexion) through an angle of 10 deg at a peak velocity of approximately 250 deg/sec, a stretch reflex was recorded from the subject's left triceps surae muscle group. Using surface electromyography, about 300 reflex responses were obtained and ensemble-averaged on 3 separate days before bed rest, 3 to 4 times in bed, and 3 times after bed rest. The averaged responses for each test day were examined for reflex latency and conduction velocity (CV) across gender and compared with spaceflight data.

### **RESULTS**

Although no gender differences were found, bed rest induced changes in reflex latency and CV similar to the ones observed during spaceflight. Also, a relationship between CV and loss of muscle strength in the lower leg was observed for most bed rest subjects.

### **CONCLUSION**

Even though bed rest (limb unloading) alone may not mimic all of the synaptic and muscle tissue loss that is observed as a result of spaceflight, it can serve as a working analog of flight for the evaluation of potential countermeasures that may be beneficial in mitigating unwanted changes in the major postural muscles that are observed post flight.